Final version
Our ref.: JELEN-10002

What is claimed is:

1. A small hole electric discharge machining method using a small hole electrical discharge machining apparatus having electrode holding means for holding an upper part of an electrode and electrode guide means for guiding a lower part of the electrode, the electrode being fed to a workpiece while the electrode is being rotated,

the method comprising:

a supplying step supplying a gas to an electrode guide of the electrode guide means;

a releasing step releasing the gas into a working liquid from the electrode guide; and

a machining step performing small hole electrical discharge machining.

2. A small hole electric discharge machining method according to claim 1, wherein the gas comprises air.

3. A small hole electrical discharge machining apparatus comprising:

electrode holding means for holding an upper part of an electrode;

electrode guide means for guiding a lower part of the electrode;

a jet nozzle injecting a water jet from the electrode holding means; and a fluid channel which supplies a gas to an electrode guide of the electrode guide means,

wherein the electrode is guided with the water jet toward the workpiece, and small hole electrical discharge machining is performed while the gas is being released from the electrode guide into a working liquid via the fluid channel.

4. A small hole electrical discharge machining apparatus according to claim 3, wherein the electrode holding means and the electrode is rotated by a motor when the small hole electrical discharge machining is performed.

5. A small hole electrical discharge machining apparatus according to claim 3, wherein

the electrode guide means further comprises:

an electrode guide sleeve having an electrode guide at its lower end, and the guide sleeve is inserted into the electrode holder so as to protrude the electrode guide member from a lower end of the electrode holder;

an inner sleeve which is provided within the electrode guide sleeve and which is coaxial with the electrode guide;

a spacer which holds, in the interior of the electrode holder, an upper electrode guide being coaxial with the electrode guide;

a fluid channel being provided in the spacer and guiding a gas being supplied from a gas supply port being provided in the electrode holder into an electrode guiding hole of the inner sleeve; and

a fixing member being provided with the spacer and having a funnel portion for guiding the water jet into an electrode guiding hole of the upper electrode guide.

6. A small hole electrical discharge machining apparatus according to claim 3, wherein the gas comprises air.

7. An electrode inserting method with a small hole electrical discharge machining apparatus having electrode holding means for holding an upper part of an electrode and electrode guide means for guiding a lower part of the electrode, the electrode being fed to a workpiece while the electrode is being rotated,

the electrode inserting method comprising:

an engaging step ~~of~~ engaging a lower part of the electrode guide means with a vacuum aspiration head that is removably engageable therewith; and

an inserting step inserting the electrode into the electrode guide means by suction power of the vacuum aspiration head.

8. A small hole electrical discharge machining apparatus according to claim 3, further comprising:

a vacuum aspiration head which is attachable/detachable with/from a lower part of the electrode guide means; and

an electrode insertion apparatus having electrode penetration detector that detects the electrode has penetrated through the electrode guide means.

9. A small hole electrical discharge machining apparatus according to claim 8, wherein

the vacuum aspiration head further comprises:

an concave recess portion which is attachable/detachable with/from the lower part of the electrode guide means; and

exhaust means for exhausting air within a sealed space that is formed by the engagement between the electrode guide means and the concave recess portion, and wherein

the electrode penetration detector further comprises, in the vacuum aspiration head, a detecting electrode which is contactable with a lower end of the electrode and an electrical-conduction detector which is provided to an electric circuit formed upon contact of the detecting electrode with the lower end of the electrode, and the electrical-conduction detector is configured to detect the electrical conduction between the electrode and the detecting electrode.